# CIS 192 Linux Lab Exercise

## Lab 1: Exploring the Linux Network VMs and NICs
## Spring 2010

**Lab 1: Exploring the Linux Network VMs and NICs**

The purpose of this lab is to become familiar with resources available in the CIS Lab (room 2504) and the CTC. This includes using VMware Server and learning how to operate the CIS 192 Networking VMs. You will do an inventory on five of the VM's and practice finding, loading and unloading the NIC drivers. This lab will also give you some practice for exchanging textual information between the Windows host system, the VMs and the remote Opus server.

**Supplies**

- VMWare Server 1.08 or higher
- CIS 192 VMs: Elrond, Fang, Frodo, Sniffer and William
- Virtual networks: VMnet3 and VMnet4

**Preconfiguration**

- Original versions of VMs.

**Forum**

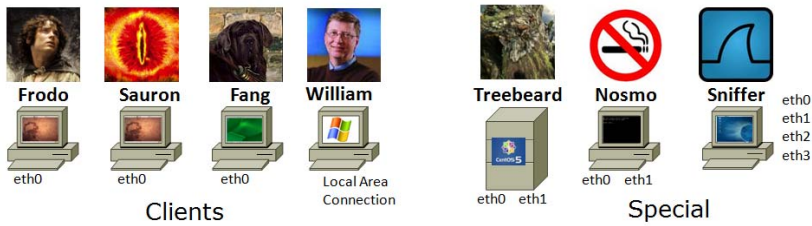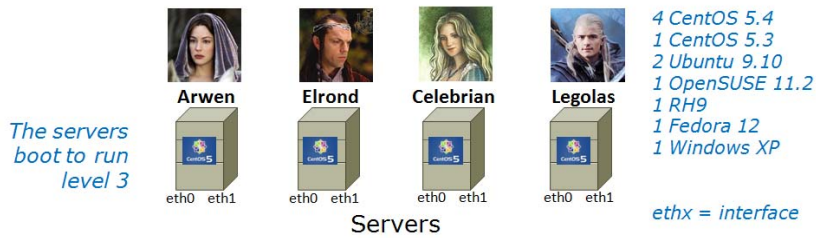Use the forum to ask for help, post tips and any lessons learned when you have finished. Forum is at: http://opus.cabrillo.edu/forum/viewforum.php?f=5

**Background**

There are dedicated systems available for CIS students in:

- the CIS Lab (http://webhawks.org/~cislab/)
- the CTC (http://www.cabrillo.edu/services/ctc/hours.html)

for working on Linux lab assignments. These systems are Windows PC's with VMware Server installed. For more information see the **Equipment module** in Lesson 1 slides.

The CIS 192 Networking VMs are shown in the diagram below.

Servers

4 CentOS 5.4
1 CentOS 5.3
2 Ubuntu 9.10
1 OpenSUSE 11.2
1 RH9
1 Fedora 12
1 Windows XP

*The servers boot to run level 3*

*ethx = interface*

Clients

Special

All the VMware stations in the CIS Lab and the CTC are connected to a private 172.30.4.0 /24 network as shown below:



CIS Lab (room 2504)                CTC
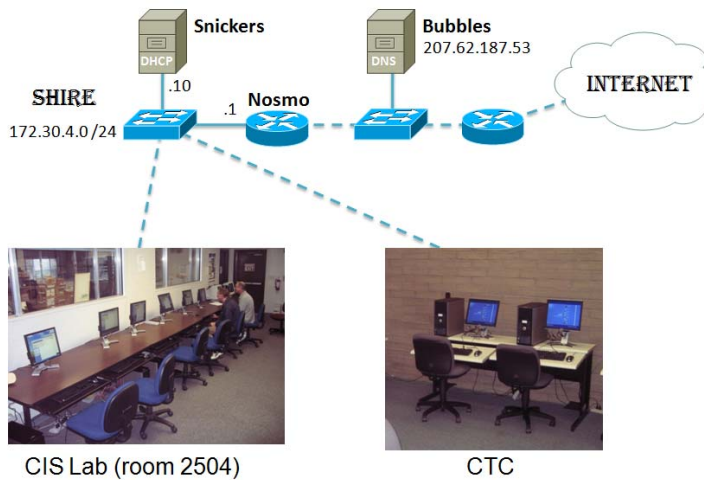
## Procedure

You will do a manual inventory for several VM's and record the information in a text file that you submit at the end of the lab. In addition you will get some practice managing an Ethernet interface and it related driver.

A template is provided as the starting point for the text file you submit. Feel free to reformat it and make it your own as long as you include the required information.

It may be helpful to review these modules in Lesson 1:
http://simms-teach.com/docs/cis192/cis192lesson01.pdf

☐   Equipment

- VMware 101
- Cabling VMs
- NIC Inventory
- NIC Drivers
- Managing Drivers
- IPv6

## Step 1 – locate a VMware Station to use

Go to the CTC or CIS lab and locate a station that is free.  These systems are Windows PC's with VMware Server installed.  They are labeled **CIS-Lab-*xx***, where *xx* is 01 to 10.

## Step 2 – Preparation

It's helpful to start any lab with pristine versions of the VM's.  Revert the following VMs back to their snapshots:

- 192-Elrond
- 192-Fang
- 192-Frodo
- 192-Sniffer
- 192-William

Get the template for this lab and start updating it:

- Download the template from http://simms-teach.com/docs/cis192/lab1.lastname and open it up with Notepad++.
- Save it as lab1.*lastname* (using your last name)
- Update the top header section with your own information.

Note the "TBA hours" should reflect the total amount of time you spent preparing for and doing this lab.  The "Station number" is the CIS-Lab-*xx* identifier found on the front of the VMware station you use.  To get CPU and RAM information for your station right-click on the CIS-Lab-*xx* "My Computer" icon on the desktop and select properties.

## Step 3 – Perform a hardware inventory

Fill out the "VM HARDWARE INVENTORY TABLE" for the each of the five VMs.  The 192-Elrond has been done for you as an example.  Use VM settings to obtain the information:

- total hard drive space (in GB, of all drives)
- RAM size (in MB)
- Ethernet connections (whether Bridged or the VMnet number)

Note that a VM may have multiple NICs and hard drives.

## Step 4 – Perform a system inventory

Fill out the "VM SYSTEM INVENTORY TABLE" for the each of the five VMs.  The 192-Elrond has been done for you as an example.

- Power on the five VMs.
- Log in as cis192 and **su –** to root.

- For Linux VMs:
  - Record the distribution and distribution version (use **cat /etc/\*-release)**
  - Record the version of the kernel (use **uname –r**)
- For the Windows VM:
  - Record the version and service pack:
  (use: Start > All Programs > Accessories > System Tools > System Information)

## Step 5 – VM NIC hardware, drivers and interfaces

Using newer versions of Linux with VMware VMs pretty much takes all the challenge out of getting the right NIC driver installed for your Linux system. With our VMs it all happens automatically. If you want some fun try the extra credit at the end of the lab.

The following are steps for identifying, locating, loading and removing NIC drivers and bringing interfaces up and down. All VMware VMs use the same NIC hardware so we won't do this on every VM.

- All of the following steps will be done using the **Elrond VM**. Make sure it is running and you have logged in as **root**. We will be doing copy and paste to your Windows lab1.*lastname* file so Elrond needs to go into graphics mode (run level 5). Do this with the **startx** command.
- Bring up a graphical terminal using the icon on Elrond's desktop.
- Run vmware-toolbox & and minimize the dialog box. This enables copy & paste.
- On Elrond, use the **lspci** and **dmesg | grep eth0** commands to identify your NIC hardware.
- Open up a web browser and browse to http://tldp.org/HOWTO/Ethernet-HOWTO.html. Look in the section 4.5 to find driver information for the various AMD NICs.
- Can you find your NIC model and the name of the driver? On Elrond, issue the **lsmod** command to see all the dynamic drivers currently loaded. These are all dynamic kernel modules.
- Look for the module with the name of the driver for the AMD NIC. You can use **lsmod | grep <driver name>** to locate it. Note this driver is used in conjunction with the MII (Media Independent Interface) module.
- Look at all the available NIC drivers (kernel modules) that are available using
  **ls */lib/modules/$(uname –r)/kernel/drivers/net*
  Note they all have a .ko suffix.
- Type **ifconfig** to see the current interfaces in operation.
- Type **ifconfig eth0 up** then issue the **ifconfig** (no arguments) command again by itself. Is eth0 up now? What is the MAC address (HWaddr)? Does it have and IPv4 address? Does it have an IPv6 address?
- Let's remove the NIC driver temporarily then load it again.
- Use **ifconfig eth0 down** to shutdown that interface on Elrond.
- Use **rmmod pcnet32** to unload the NIC driver (kernel module)
- Use **lsmod** or **lsmod | grep <driver name>** to verify the module is no longer loaded.
- Use **modprobe <driver name>** to reload the kernel module and use **lsmod** to verify it is loaded. Note that the modprobe command does not require the path or suffix for the network drivers in */lib/modules/$(uname –r)/kernel/drivers/net.*
- Fill out the "VM NIC HARDWARE, DRIVERS AND INTERFACE" section with:
  - NIC vendor name
  - NIC model number
  - Name of the driver used for the NIC
  - The MAC address for the eth0 interface
  - The IPv6 address for eth0 interface when its up.

- The **lsmod | grep <driver name>** output showing the loaded NIC driver
- A short listing of the NIC drivers in your
    - **/lib/modules/$(uname –r)/kernel/drivers/net** directory.

## Step 6 – Record Linux commands for your own future use

The **man** command is useful for documenting commands, options and arguments.  However it is almost guaranteed that there will be no examples for a command you can't get to work.

Add example commands and key information to the "COMMAND/CONFIGURATON SUMMARY" section.  Make this something you will find useful in the future after this course is long over.  Think of it as a crib sheet you wish you had with you the next time you are in an igloo on the north pole and your life depends on getting a Linux server connected to the network.

## To turn in

When finished with this lab, record your total TBA hours in your lab1.*lastname* file.  This should reflect the total number of hours you spent preparing for and getting this lab done.

To submit your work, on the Windows VMware station, bring up the Command Prompt line window (Start > Run… > cmd), navigate (use dir and cd commands) to your text file and use the pscp to submit your work:

**pscp lab1.*lastname* cis192@opus.cabrillo.edu:lab1.*lastname***

Remember, **late work is not accepted**, so please start early, plan ahead for things to go wrong and use the forum to collaborate.  Submit as many times as you like up to the deadline.  Each new submital will overwrite the previous one.

## Grading rubric (30 points)

5 points for correct submittal, professional appearance and quality
5 points for correct VMware host PC station information
5 points for correct VM hardware inventory
5 points for correct VM system inventory
5 points for correct and complete NIC, driver and interface information
5 points for a useful command/configuration summary

## Extra Credit (5 points)

Repeat Step 5 for both eth0 and eth1 NICs on one of the older Elronds in the System pods in room 2504.  These are not virtual machines but real computers with real NICs.